

TWENTY YEARS OF SANITARY ENGINEERING IN CALIFORNIA

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IN 1915 the California Legislature, harassed by sanitary problems and pursuing the precedent of a few other states, provided a Bureau of Sanitary Engineering in the State Board of Public Health. It has since been maintained with appropriations varying from \$15,000 to \$25,000 per year. The Public Health Act of 1907, providing for a permit system and state approval of plans and sites, has been rigorously applied to sewage disposal projects, and, as far as time has permitted, the companion Sanitary Water Systems Act has been applied to water supply. Largely as a result and also influenced by the general improvement in sanitary engineering knowledge throughout the country, and the promotion of better sanitation by health officers, water supplies and sewage disposal are far from the plague they once were, as this review will indicate. It is the story of the quiet work of many people throughout the State, with the bureau as its center.

The highlights of accomplishment where contrasts of past and present are striking may be recounted as follows. Prior to 1915 so few sewage treatment plants had the benefit of wise selection of sites and methods of treatment that out of some eighty-two works built in California up to that time, forty-five, or over half, have since been abandoned. Out of 181 sewage treatment plants built under state supervision since 1915, only ten plants have had to be replaced by others. The longer life of usefulness of so many plants must have been worth huge sums to the cities and towns of the State. So, too, has been the almost total absence of litigation over unsanitary sewage disposal and water supply; and also the movement which the State is in peculiar position to foster, whereby communities have joined in the common disposal of their sewage. Nine treatment plants now solve the problem of disposal for forty-three communities and spare a large countryside the annoyance of neighboring sewage works.

Through attacks by many agencies, on many fronts, the greatest of which is water disinfection and better laboratory control, typhoid fever epidemics, as derived from water, have almost disappeared, the last water-borne outbreak in California having occurred in 1924. Prior to that time, scarcely a year failed to produce one or more water-borne typhoid outbreaks. Sewage treatment prior to 1915 was limited almost entirely to septic tanks. The designs of the bureau for a trickling filter at Reedley in 1915, and for an activated sludge plant at Folsom Prison in 1917, inaugurated the two most common of the high grade or "complete" processes of sewage treatment to be seen in the State today. Nearly half of the present-day sewage treatment works represent "complete" processes in which not only is the sludge removed from the sewage, but the sewage is rendered clear and odorless. Recently a few plants have also disinfected the effluent and several have been induced to employ better odor control in the plants. Odorless sewage disposal, now gaining recognition throughout the country, has always been emphasized since the Bureau was created.

One hundred forty-three places have put in new sewer systems since 1915 and the State is in a fair way to attain, generally, the convenience of sewerage and plumbing—probably within another twenty years.

By reason of the endemic and epidemic typhoid fever which kept the State alarmed, the first major task in 1915 was to raise the safety of water supplies. The Bureau at once established state-wide bacterial control of water systems and largely as an outcome of this many dangerous supplies were abandoned, others protected, and almost 150 places have provided some form of water treatment, the most common of which is water disinfection. The only water purification prior to 1915 was a sort of straining practiced at three or four places and some attempt at water disinfection. There are now thirty-six filtration plants, about half of which will compare with any in the

country. More recently, municipal water softening has appeared. All these waterworks have a frequent bacterial control through the water department or the health department. It may be hard to realize that in 1915 few waterworks men were willing to have their water tested.

Cross-connections between private and foreign sources of water are generally considered to represent the last remaining common menace to the purity of water supplies. Not less than one thousand of such connections have been done away with in this State within recent years, under plans prepared or approved by the Bureau.

Each year approximately one hundred water supplies are reported on for certification to the United States Public Health Service, which in turn certifies them by reason of their use on some three hundred common carriers.

There are approximately eight hundred waterworks and sewer systems in California. These have been inspected at irregular intervals and in 1930 to 1932 all municipal systems, aggregating about seven hundred, were surveyed systematically and fully reported by the Bureau. Standards of sewage disposal in state institutions have been brought to a high plane through the concerted planning by the Bureau of the State Department of Engineering, which actually builds the works.

State swimming-pool sanitation was pioneered in California in 1917. The number of pools is now close to three thousand. Almost all the states have followed closely in the path this State has set.

With the City Health Department of San Francisco, sanitation of oyster beds, clam beds, and shellfish shucking plants was inaugurated here a few years ago. State-wide regulations were devised and we believe the program accounts in large part for the recent reduction of typhoid fever to the vanishing point in San Francisco, the shellfish center of the State.

Mosquito and malaria control have been organized on a wide scale, particularly in the Sacramento and San Joaquin valleys. The malarial fevers and mosquito pests of not many years ago are probably still fresh in many minds.

Rural sanitation has been aided by the distribution of thousands of copies of bulletins giving instructions on rural sewage disposal and water supply, and country homes now generally enjoy piped water and city plumbing. Cropping of sewer farms has been under State regulation since 1917.

Standards of sanitation in the mountain playgrounds have been established on an exceptionally high plane in cooperation with the National Forest Service. The squalid camp grounds and roadsides of fifteen or twenty years ago are seldom seen nowadays. Through the early work of the Bureau and the sanitary inspectors, the purity of Lake Tahoe was saved for recreation and water supply. One of the first tasks in 1915 was to undo the running of sewers into the lake, then a common sight at nearly every resort.

In twenty years, it is easy to forget the innumerable and notorious instances of stream pollution that plagued the State a generation ago. For example, there was Merced River which was receiving sewage in the heart of Yosemite. Auburn Ravine, below Auburn, was substantially a sewer. Yuba River, opposite the Marysville sewer farm, kept two cities in a turmoil. The blue water of the Feather River, at Oroville, could not be used on account of the taint of sewage. Tuolumne River, below Modesto, was a source of endless complaint. The Sacramento River, at Dunsmuir, was notorious for the piles of sewage along its edge. Kings River, at Reedley, aroused Kings County into an expensive litigation against the city. Sonoma Creek, below Sonoma State Home, was a source of stench through a famous vacation belt. Truckee River, at Truckee and Floriston, was useless even for fishing. Santa Rosa was suffering under a 27-year-old suit by reason of pollution in Santa Rosa Creek. Napa River, from Calistoga to its mouth, polluted near-by wells, caused offensive odors, and prevented picnicking on its banks. Several of the famous beaches of the State were under quarantine at one time or another. For example, the beaches at Santa Cruz, Capitola, Santa Barbara, Monterey, and the wonderful beaches off Santa Monica, Venice,

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Hermosa and Redondo and Long Beach. Recently, a noteworthy dent has also been made in reducing the sewage pollution of San Francisco Harbor through the construction of several sewage treatment works.

There were also many notorious sewer farms and sewage treatment works that no longer occupy the picture. For example, the sewer farm at Pasadena, once the occasion of a complaint by six thousand people; numerous sewer farms in Orange County, which were replaced by a joint outfall to the ocean; sewage works right in the towns of Gilroy, East San Jose, College Park, Santa Clara, San Luis Obispo, Yreka, and Beverly Hills. There were scores of others of which space does not permit mention.

It is hard to believe that in 1915 cities like Antioch and Pittsburg used river water practically without treatment and at the same time ran their sewage back into the same stream. Imperial Valley and the Mother Lode towns had no treatment of their ditch water other than passage through small weed-grown settling basins. The water supplies of the East Bay cities was a source of daily complaint. The same was true of the water supplies at Los Banos, Eureka, and Beverly Hills. Now excellent filtration works, or in some cases simpler devices, have disposed of the problems of all these places, troublesome alike to customer and management.

The work of state sanitation has followed many other trails, more or less related and contributory to those illustrated. For example, there has been much work on the water supplies of the State with reference to iodine and goiter; fluorine and mottled enamel of teeth; behavior of cyanides in water supplies; field and laboratory studies of the various industrial wastes common to this State, particularly canneries, milk plants and beet-sugar factories; pollution studies of streams; hundreds of performance tests of waterworks and sewage treatment works as a means of perfecting and maintaining good operating conditions; mapping nuisances around numerous sewage disposal areas; silicosis hazards in industry, and like tasks. Standards of sanitation for bottled water plants were once devised. Though never adopted, they have been widely distributed and had noteworthy educational influence. An important, in fact indispensable arm of the Bureau, has been a sanitary engineering laboratory in which tens of thousands of water samples have been examined and in which test methods have been perfected for the examination of water, sewage, and trade wastes. Research into the character of these substances and methods has also featured the laboratory work.

One scarcely realizes the massive improvement in the sanitary engineering environment of the State until viewed in retrospect over such a term of years. In spite of the progress, however, scores of troublesome problems, particularly the expensive and difficult ones, still remain.

CLINICAL NOTES AND CASE REPORTS

LUNG FAILURE

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LUNG failure may be minute or severe. It happens at birth—collapsed or atelectatic lungs; and it takes place in senility—wet or hypostatic pneumonia.

There are many degrees of many maladies, affecting many lungs differently.

1. Anatomically (malformation);
2. Physiologically (acidosis);
3. Pathologically (inflammation); and
4. Combining forms of these three.

The inadequate bellows of a congenital pulmonary insufficiency, either on account of defective central or peripheral innervation, circulatory,

muscular, or bony development or injury, needs recognition, study, and sane management. Often we see "the Mark Twain type of steamboat" lung—the one that had an engine with a four-foot boiler and a twelve-foot whistle, and every time the whistle was blown the engine stopped!

Physiological lung failure is exemplified in the habitual inadequate breather, the acidotic, the asthmatic, and the endocrine-imbalanced individual, and are not uncommon. These are for the most part compensatory affairs.

The pathological causes for lung failure are legion, only the grossest getting attention, often too late. Such chief complaints as cough, expectoration, hoarseness, pain, or shortness of breath call for:

1. Inspection, in a good light for asymmetry, defects, lagging and abnormal pulsations.

2. Palpation, to confirm or dispute No. 1, for muscle spasm, tenderness, and thyroidal, lymph and breast lumps.

3. Percussion, to "sound" the intrathoracic organs and liver. But let us not fool ourselves: after listening (auscultation), take a look with the fluoroscope.

4. Auscultation, with the unaided ear (because we always have it with us). Know normal heart and lung sounds, then it is not difficult to hear the abnormal.

After these four steps:

5. Contemplate and make provisional diagnosis or diagnoses. Then try to disprove ourselves, instead of "crooking" to bolster up our diagnosis. Use the hollow needle, if we suspect fluid; use clinical and x-ray laboratory assistance for sputum, blood and tissue study; also the bronchoscope. And if a demise, a thorough-going autopsy.

REPORT OF CASES

One is one; two, a couple; three, the fewest of a few—here are three:

CASE 1.—A fairly common cause for lung failure. A 24-year-old mother of an eleven months' child was first examined December 31, 1934, whose pediatrician told her, four months ago, "to take cod-liver oil." It did not cure her. Yet an x-ray technician, not a physician, referred her last Monday, and I found her temperature 102 degrees at 2:30 p. m., pulse 115, cheeks flushed, playing of alae of nose, fast, shallow breathing, lagging of right chest, numerous râles which did not clear on coughing, cavitations on right, while the fluoroscope confirmed the diagnosis of "advanced, active consumption." I referred her back to the x-ray technician for a "chest plate" for record. Died November 23, 1935.

CASE 2.—A left-lung affair in a 26-year-old single woman who "had 'flu' in France," recovered, but "spit up" for a long time afterward. In March, 1934, she had a chest cold. A physician told her to go home and go to bed for ten days. He reexamined her and said to remain in bed. I saw her and recognized "left lung failure," due to chronic adhesive lower-lobe pathology—"residual lung abscess." September, a pneumonitis; my associates diagnosed tuberculosis. She recovered, and is well and at duty, is well nourished, and sputums are all "negative."

CASE 3.—I knew what was the matter with this 60-year-old cachectic man, an ex-soldier, when I saw him in consultation at the National Veterans' Hospital: "Malignancy of transverse colon with metastases to the right lung." But at autopsy the lung tumor was found to be a laminated aneurysm!

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